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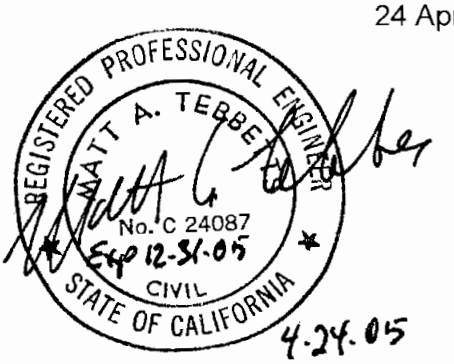
Lake Cuyamaca Recreation and Park District Wastewater System Compliance Report

24 April 2005



Prepared for

Lake Cuyamaca Recreation and Park District
15027 Highway 79
Julian, California 92036

K/J Project No. 014663.00

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Section 1: Introduction and Purpose

Order No. R9-2004-0015, Waste Discharge Requirements for the Lake Cuyamaca Recreation and Park District were adopted by the San Diego Regional Water Quality Control Board (Regional Board) on June 10, 2004. The Lake Cuyamaca Recreation and Park District (District) completed the construction of the surge tank, septic tank, leach field and monitoring wells in November 2004. This Compliance Report is submitted in accordance with Section C.2., Order No. R9-2204-0015 and is a request for authorization to begin the discharge of wastewater into the disposal facilities.

1.1 Septic System Improvements

The District retained a local contractor and installed the surge and septic tanks and leach field system. The facilities were inspected by the County of San Diego Department of Environmental Health and have been approved for the proposed discharge.

A certification report was filed with the Regional Board under separate cover for this portion of the disposal system.

1.2 Monitoring Wells

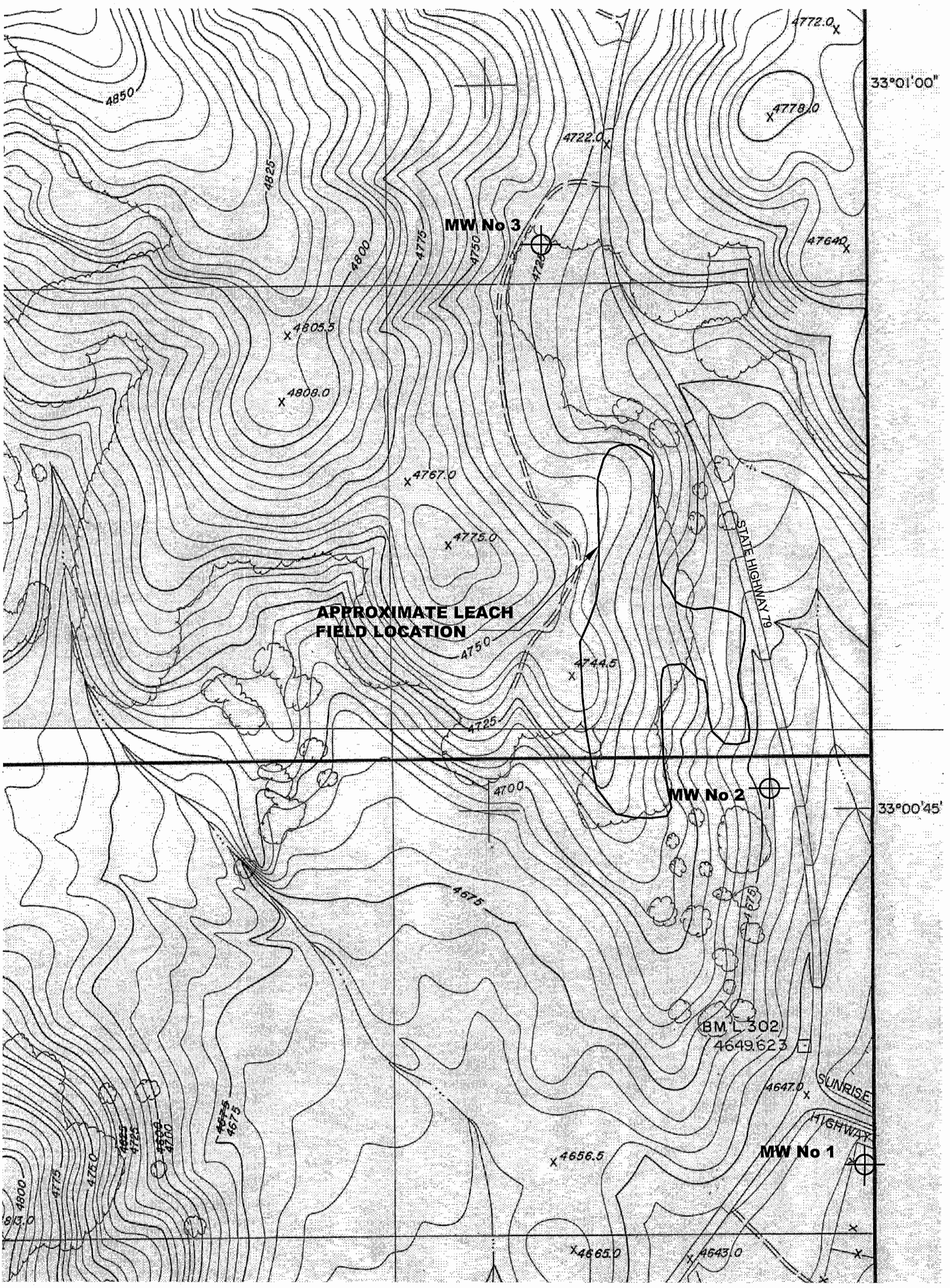
A proposed monitoring well plan was submitted to the Regional Board on 6 June 2004. After review of the proposed plan and discussions held with Regional Board staff, the decision was made to finalize the plan after the wells have been installed and information about the fractures within the bedrock rock in the vicinity of the leach field are better defined using monitoring well installation information.

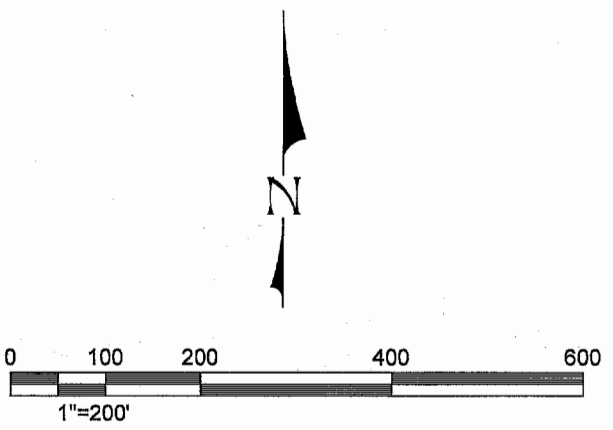
Three monitoring wells were installed in October and November 2004. The well locations are shown on the following figure and the well logs are included in Appendix A. Monitoring well depth and groundwater depth information observed when the wells were installed are summarized in Table 1.

Table 1: Monitoring Well Information

MONITORING WELL	TOTAL DEPTH (FT)	DEPTH TO GROUNDWATER (FT)
MW-1	50	30
MW-2	30	18
MW-3	40 [1]	Greater than 40 [1]

[1] Initially drilled to a depth of 233 feet. Saturated water table encountered at a depth of 157 feet. Filled to a depth of 40 feet and outfitted with a PVC casing.





Kennedy/Jenks Consultants

LAKE CUYAMACA
PARK AND RECREATION DISTRICT

Wastewater Infiltration Disposal System

014663.00
REV. 6.09.04

Monitoring Well Site Plan

The Monitoring Plan identified MW-1 as the proposed compliance well. MW-2 was considered as the likely candidate for the trigger well and MW-3 was intended to provide background water quality information.

Groundwater was not present in MW-3 when it was installed in November 2004. Groundwater has recently been observed in MW-3 and the results of water quality analysis are reported in Section 3.

Section 2: Groundwater Monitoring Results

Order No. R9-2004-005 sets forth performance requirements for nine constituents that must be met in all compliance wells. Compliance constituents and the maximum limitations for each are summarized in Table 2.

Table 2: Performance Requirements

CONSTITUENT	DAILY MAXIMUM (MG/L)	12-MONTH AVERAGE (MG/L)
Total Dissolved Solids	625	310
Nitrate (as NO_3)	9.0	4.5
Boron	1.4	0.70
Chloride	105	55
Sulfate	107	54
Manganese	0.09	0.045
Fluoride	1.8	0.90
Methylene Blue Active Substances (MBAS)	1.0	0.45
Iron (Fe)	0.55	0.30

Groundwater quality testing began on October 8, 2004 and has included testing of samples taken from MW-1 and MW-2 on several occasions. The initial sample taken from MW-1 on 8 October, 2004 indicated concentrations of five of the nine compliance constituents exceeded the limitations provided in Table 2. Additional sampling and testing has been performed and the results are summarized in Tables 3 and (all samples exceeding compliance levels are shown in red). Copies of the laboratory results are included in Appendix B.

The samples obtained in October and December 2004 were collected without purging the monitoring wells prior to sampling. The samples obtained in February and March 2005 have been collected after purging each well by pumping 3 well volumes prior to collecting samples.

Table 3: Monitoring Well 1 Water Quality

CONSTITUENTS	Monitoring Wells/ Date Sampled				
	MW-1 10/8/04	**MW-1 12/23/04**	**MW-1 2/17/05**	**MW-1 2/28/05**	**MW-1 3/25/05**
TDS	692	232	113	145	100
Nitrate (as NO_3)	92	9.42	15	13.3	9.61
Boron	0.12	0.061	ND	ND	ND
Chloride	124	20.4	7.46	8.94	4.4
Sulfate	114	39.7	4.43	5.84	2.8
Manganese	0.04	0.28	0.30	0.02	0.09
Fluoride	0.47	0.44	0.09	0.14	0.11
MBAS	0.11	0.05	<0.05	0.231	ND
Iron (Fe)	3.8	8.35	7.33	1.22	7.55

Groundwater quality in MW-1 remained above the compliance levels for nitrate and iron in all samples. The concentration of manganese was observed to be below the compliance level in two samples and is equal to the daily maximum and above the 12-month average concentration in the most recent sample (25 March 2005). The high concentration of TDS, chloride and sulfate observed in the first sample has not occurred in subsequent samples.

Table 4: Monitoring Well 2 and 3 Water Quality

CONSTITUENTS	Monitoring Wells/ Date Sampled				
	MW-2 12/23/04	**MW-2 2/17/05**	**MW-2 2/28/05**	**MW-2 3/25/05**	**MW-3 3/28/05**
TDS	284	169	157	126	182
Nitrate (as NO_3)	16.7	8.01	8.72	9.74	13.9
Boron	0.035	0ND	ND	ND	ND
Chloride	93.2	11.6	13.3	11.5	64.8
Sulfate	26.7	11.2	12.8	11.6	16.2
Manganese	ND	0.17	0.04	0.02	0.01
Fluoride	0.40	0.09	0.10	0.14	0.10
MBAS	0.13	<0.05	<0.05	ND	ND
Iron (Fe)	2.86	1.65	0.86	0.69	0.18

Groundwater in MW-2 has exceeded compliance levels for nitrate and iron in all samples. Manganese was exceeded in one sample and the initial high reading in chloride has not occurred sense the first test sample.

Groundwater sampled in MW-3 on 28 March 2005 was analyzed and is reported in Table 4. Chloride is high as was observed in the MW-1 and MW-2 samples (the initial samples may be high in chloride due to the use of a slotted PVC casing and the associated leaching of chloride into the groundwater that has a short term affect on water quality). Nitrate exceeds the compliance level as is found in the other wells. All other constituents are under the compliance levels, including iron.

Order No. R9-2004-0015 was issued with the goal of allowing the discharge of wastewater that exceeds the groundwater quality objectives as long as the discharge does not result in groundwater quality measured in the selected compliance well(s) to exceed the constituent values listed in Table 2 above.

The system is in compliance with six of the nine constituents based on the 25 March 2005 water quality analysis for the MW-1 water quality data and seven of the nine constituents based on MW-2 water quality data. With the concentration of three performance constituents above the

compliance values in the most recent samples collected in the proposed compliance well (MW-1), the system can not be certified to be in full compliance with Order No. R9-2004-0015.

Section 3: Non-Compliance Discussion

The Report of Waste Discharge prepared for the proposed discharge (Kennedy/Jenks Consultants, 28 January, 2002) concluded that the local groundwater resource has sufficient assimilative capacity to allow the discharge to occur without causing groundwater quality to exceed the water quality objectives provided in the Water Quality Control Plan for the San Diego Basin (9) (Basin Plan). The analysis was based on observed levels for the nine constituents listed in Table 2 obtained from groundwater samples taken from local potable supply wells and two hand-dug wells located near the proposed discharge facility site.

The two constituents that exceed the compliance levels, nitrate and iron, where observed at high levels in some areas around Lake Cuyamaca, but were projected to be below the Basin Plan objectives in the vicinity of the proposed discharge thereby providing assimilative capacity.

Possible causes for the high concentration of iron and nitrate are discussed below and alternative methods to achieve compliance are presented in Section 4.

3.1 Wild Fire Water Quality Impacts

The project site was burned during the Cedar fire that occurred in October 2003 and virtually all of the vegetation on the site was consumed by the fire. The intensity of the fire was such that the roots of the larger trees onsite burned below the ground surface as evidenced by the depressions observed in the soil in many areas. The extent of the burned area extends well beyond the project site boundaries.

A number of studies have been performed that document impacts to local surface and groundwater quality in areas that have experienced a fire (several articles are listed in the References section of this report). The studies indicate increased levels of various compounds are released in the soil and are then leached into local groundwater.

3.1.1 Nitrogen Concentrations Levels

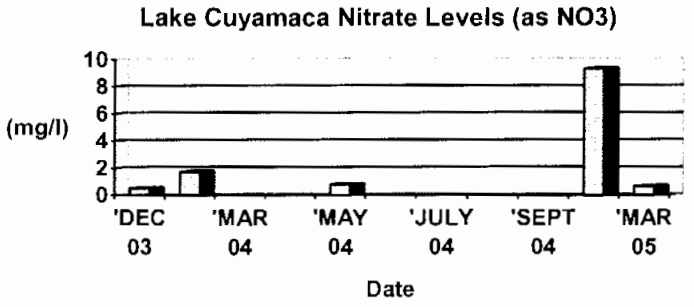
Forest fires have been found to be significant chemical reactions that release many different chemical elements that are subject to movement through the soil as precipitation occurs after the fires. Nitrogen that has been taken up by plants and integrated into plant tissues is an organic nitrogen form. When vegetation dies or falls to the forest floor, the nitrogen released by decomposition is converted to an inorganic form by microbes (known as the nitrogen fixation process) and it becomes available for uptake and use by living vegetation. The forest fire process greatly accelerates this process and a portion of the organic nitrogen in burned vegetation is converted to nitrogen gas and released to the atmosphere while a portion falls to the forest floor as inorganic nitrogen.

The form of inorganic nitrogen is ammonium (NH_4) or nitrate (NO_3) which are both available for vegetation use. Soil microbes through a process known as nitrification, will convert ammonium to nitrate thereby increasing the nitrate levels within the soil column.

After the fire, the rate of uptake of inorganic nitrogen by vegetation is a function of the amount of surviving vegetation. In areas of severe fires (such as the project site) where nearly all vegetation has been burned, the uptake of inorganic nitrogen can be low. Subsequently, precipitation results in water percolating through the soil and the highly soluble nitrate readily moves through the soil.

The affects of nitrogen released in fires on groundwater and surface waters have been found to peak 6 to 12 months after fires and has been observed to increase nitrate concentrations by 150% (Wan et. al., October 2000). The increase in nitrate in the soil is also attributed to atmospheric deposition that has been observed in higher elevations similar to the Lake Cuyamaca area (Riggan, et. al., 1994).

Increased nitrate in surface water after fires also occurs. Nitrate within Lake Cuyamaca, owned and operated by the Helix Water District (Helix), was reported to be below detection limits in the Report of Waste Discharge (Table 9) and is typically low in other samples collected by Helix. Helix has provided a summary of nitrate measurements in Lake Cuyamaca during the period of December 2003 through March 2005 (before and after the Cedar fire) and the data is shown in the following graph.



Nitrate levels, which normally are below detection limits as noted above, exceeded detection limits in December 2003 and January 2004 immediately after the fire and in May 2004. The concentration increased dramatically in October 2004 to a level 5 to 10 times higher than previous observed levels.

Precipitation levels over the winter of 2003-04 were well below normal and did not result in significant runoff. The 2004-05 winter precipitation has been well above normal levels beginning in October 2004 and Lake Cuyamaca is now at a level that is experienced on average about once every ten years.

Based on a review of studies performed for other burned areas and the observed nitrate levels in Lake Cuyamaca, an increased level of nitrate in the local groundwater is thought to be the result of the Cedar fire and, if that is a correct finding, is expected to decline. The rate of decline is uncertain and would certainly occur over a period longer than surface water.

3.1.2 Iron and Manganese Concentration Levels

A review of available literature indicates increases in iron and manganese due to the affects of the Cedar fire is possible. A study performed in deforestation areas where slash and burn is used to clear land (Williams, 1997) observed a more than 10 fold increase in manganese levels. Increased iron and manganese concentrations in reservoirs below burned areas were found to increase by a study team in Australia (ACT, January 2005).

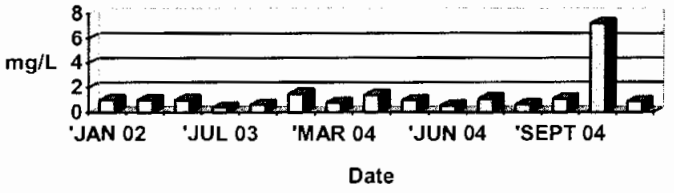
It is anticipated that the intense heat caused by the fire could result in the conversion of iron and manganese to a soluble form increasing resulting the concentrations of both constituents in groundwater.

High iron concentration is commonly found in groundwater throughout the Lake Cuyamaca area as reported in the Report of Waste Discharge (reported as ranging from 1.12 mg/l to 8.69 mg/l in the three wells providing water supply for the District facilities). However, iron levels where found to be below the Basin Plan groundwater objective (0.30 mg/l) in groundwater sampled in the nearby Tulloch hand-dug well (0.27 mg/l) and above the objective in the Daley hand-dug well (0.54 mg/l) located farther to the east.

Similar observations where made for manganese. Local District supply wells are above the Basin Plan objectives while the groundwater in the hand-dug wells was found to have manganese concentration below the objective.

Iron in Lake Cuyamaca is monitored by Helix Water District and the data is presented in the following graph for the period January 2002 through March 2005.

Lake Cuyamaca Iron Levels



The data indicates iron levels exceeding the Basin Plan groundwater objective of 0.30 mg/l over the entire period (ranging from a low of 0.40 mg/l to a high of 7.2 mg/l). A significant increase occurred in October 2004 coinciding with the first high runoff period after the Cedar fire.

The significant increase in iron within Lake Cuyamaca and the reported increase found in other burn areas indicate the high iron concentrations found in MW-1 and MW-2 may be the result of the fire. The low concentration found recently in MW-3 does not support that observation.

Manganese concentration in Lake Cuyamaca has ranged from a low of 0.050 mg/l to a high of 0.41 mg/l. The manganese concentration in the lake did not increase dramatically in October

2004 and the data does not support the concept that the observed levels in MW-1 and MW-2 are the result of the fire as reported in technical studies in other areas. Manganese concentrations in groundwater exceed the Basin Plan objective in several wells in the area and have exceeded the objective in Lake Cuyamaca.

Section 4: Approaches to Achieving Compliance

The groundwater monitoring results indicates the water quality in both monitoring wells is generally improving. This trend may continue as noted in Section 3 and it is possible that nitrate and iron concentrations could drop below the compliance levels for each. Should that occur, it would be possible to issue a compliance report indicating full compliance.

There remains the possibility that one or both constituents will remain above the compliance level. The following sections provide alternative actions that could be taken by the District to achieve compliance.

4.1 Nitrate Compliance Alternatives

Options for the reduction of nitrate in the discharge reaching groundwater adjacent to the disposal site include the following:

1. Source control
2. Treatment
3. Land application

The first option is impractical as nitrogen is found in wastewater generated by most activities and the rest room facilities provide the visiting public an important and necessary service.

Treatment of the wastewater could be provided either at each of the three holding tank sites or at the disposal site. There are a number of companies that offer small treatment units that are able to provide nitrogen reduction. Treatment would provide a means to reduce the concentration of nitrate where compliance would be achieved prior to discharge into the leach field.

The third option (land application) could be accomplished by pumping groundwater located below the leach field that is high in nitrate and spraying the groundwater on the site to promote uptake of nitrogen by the vegetation. The quantity of irrigation would be determined by considering the concentration of nitrogen in the groundwater and the uptake of nitrogen in the forested area (the district's site has a total area of 37 acres). The application rate would be set to provide a balance between the nitrogen uptake and the nitrogen discharged in the wastewater. The placement of the well (or wells) would be set to minimize the direct collection of leachate since the disposal site is located in a drinking water reservoir watershed (Lake Cuyamaca).

If treatment is provided, compliance would be achieved in the effluent prior to discharge into the leach field. For the land application option, compliance would be determined by recording the nitrogen concentration in the wastewater and groundwater and adjusting establishing application rates to achieve the required uptake of nitrogen by the onsite vegetation.

4.2 Iron and Manganese Compliance Alternatives

Options available for the reduction of iron and manganese in the discharge reaching groundwater adjacent to the disposal site are as follows:

1. Source Control
2. Treatment

The source of iron and manganese in the District's wastewater is primarily the water supply for each facility, local groundwater. High iron and manganese concentration in groundwater is common in the area and is above the Basin Plan objective in each of the three wells used as water supply by the District. The camp ground, restrooms, fish cleaning and restaurant uses are not likely adding significant quantities of either constituent. The most effective source control option would be well head treatment for the removal prior to use. Such treatment is common in many areas with high iron and manganese in local groundwater supplies. An important consideration is the waste discharge that must be disposed in an acceptable manner for such treatment.

Providing treatment for the removal of iron and manganese in the disposal system could be accomplished by precipitation of each constituent into the sludge layer that could be allowed to accumulate in the surge and septic tanks located at the disposal site. The selection of the appropriate coagulant would require consideration of an effective dosage rate and mixing required providing adequate contact time for precipitation.

Either of these options would be designed to achieve compliance prior to discharge into the leach field.

4.3 Requested Compliance Schedule

The District has been monitoring groundwater quality since October 2004 and the water quality has been found to vary significantly for several of the constituents. Continued monitoring will provide a better understanding of the groundwater quality and the effects of the Cedar fire.

Should nitrate, iron or manganese continue to exceed the compliance values, a technical analysis will be required in order to determine the appropriate approach to achieving compliance. The District will need sufficient time to complete the studies and subsequent actions that could include additional environmental reviews in accordance with the California Environmental Quality Act.

In order to provide sufficient time for groundwater quality stabilization and possible project improvement actions, a five year compliance period is requested.

References

Riggan, Phillip J., Lockwood, Robert N., Jacks, Paula M., Colver, Charles G., October 2000 Effects of Fire Severity on Nitrate Mobilization in Watersheds subject to Chronic Atmospheric Deposition. Pacific Southwest Research Station, USDA Forest Service, Riverside California, Environmental Science Technology, Vol. 28, No. 3, 1994.

Wan, Shiqiang, Hui, Dafeng, and Luo, Yiqi, October 2000, Fire Effects on Nitrogen Pools and Dynamics in Terrestrial Ecosystems: A Meta-Analysis, Department of Botany and Microbiology, University of Oklahoma, Norman, Oklahoma.

Williams, M. R., Fisher T. R., Melack J.M., Solute Dynamics in Soil Water and Groundwater in a Central Amazon Catchment Undergoing Deforestation, Biogechemestry, September 1997, vol. 38, no. 3, pp. 303-335 (33), Kluwer Academic Publishers

ACT Brushfire Summaries, Effects of Varying Fire Regimes on Hydrological Processes, Report No. 5, January 2005, AMOG Consulting, Notting Hill Vic 3168, Australia

Appendix A: Monitoring Well Logs

DATE DRILLED 9/27/04 BORING NO. MW-1

GROUND ELEVATION 4635' ± SHEET 1 OF 1

METHOD DRILLING Hollow Stem Auger

LOGGED BY MM DRIVE WEIGHT N/A DROP N/A

DEPTH (feet)	DEPTH (meters)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	U.S.C.S. CLASSIFICATION	DESCRIPTION	WELL CONSTRUCTION
5	1.5								ALLUVIUM: Silty SAND w/ trace clay. Light brown, dry to damp, loose. Micaceous; fine sand. Becomes damp at 4 feet.	2 inch blank PVC pipe; Concrete; 3.0
10	3.0								SAND. Light brown, damp, loose. Fine to medium grained. Micaceous. Becomes moist at 11 feet.	
15	4.6									Sand and Portland Cement Slurry
20	6.1								Clay layer at 21' moist to wet. Dry to damp below clay layer. Becomes moist at 23 feet.	
25	7.6									28.0
30	9.1				▽					Bentonite; 30.0
35	10.7								WEATHERED BEDROCK (GRANITIC): Grayish brown, moist, medium dense. Moderately weathered.	0.020 inch slotted PVC pipe
40	12.2									#3 Sand
45	13.7									
50	15.2								Total Depth = 50.0 feet. Groundwater encountered at 30 feet	50.0
55	16.8									
60	18.3									

Reviewed Date:

Reviewed By:

BORING LOG 77300R-1.GPJ TESD.GDT 1/3/05

Testing Engineers - U.S. Labs
7895 Convoy Court, Suite 18
San Diego, CA 92111

BORING LOG

Lake Cuyamaca Recreation Park
Lake Cuyamaca, California

CONTRACT NO.	REPORT DATE	FIGURE
77300		A-2

DATE DRILLED 11/30/04 BORING NO. MW-2
GROUND ELEVATION 4670' ± SHEET 1 OF 1
METHOD DRILLING Air Rotary
LOGGED BY CS DRIVE WEIGHT N/A DROP N/A

DEPTH (feet)	DEPTH (meters)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	U.S.C.S. CLASSIFICATION	DESCRIPTION	WELL CONSTRUCTION
5	1.5							SM	ALLUVIUM: Silty SAND w/ trace clay, Dark brown, moist, loose. Some rootlets, Micaceous	2 inch black PVC pipe, Concrete, 3.0, Bentonite, 8.0, 0.020 slotted PVC pipe
10	3.0								DECOMPOSED GRANITE: Light brown, damp, medium dense.	
15	4.6				▽					
20	6.1								HARD ROCK, difficult drilling	Sand Slurry
25	7.6								DECOMPOSED GRANITE Granitic BEDROCK	
30	9.1								Total Depth = 30.0 feet Groundwater encountered at 18 feet	30.0
35	10.7									
40	12.2									
45	13.7									
50	15.2									

Reviewed Date:
Reviewed By:

BORING LOG 77300R-1.GPJ TESD.GDT 1/3/05

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BORING LOG

Lake Cuyamaca Recreation Park
Lake Cuyamaca, California

CONTRACT NO.	REPORT DATE	FIGURE
77300		A-1

DATE DRILLED 9/30/04 BORING NO. MW-3
GROUND ELEVATION 4725' ± SHEET 1 OF 5
METHOD DRILLING Air Rotary
LOGGED BY Driller DRIVE WEIGHT N/A DROP N/A

DEPTH (feet)	DEPTH (meters)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	U.S.C.S. CLASSIFICATION	DESCRIPTION	WELL CONSTRUCTION
									Base GRAVEL/SAND	2 inch black PVC pipe
									Gravelly CLAY	Concrete 2.0
									Dark brown	
5	1.5									
										Portland Cement Slurry
10	3.0									
15	4.6									16.0
										Bentonite 18.0
20	6.1									0.020 inch slotted PVC pipe
25	7.6									
30	9.1									#3 Sand
									Dense gray SILTSTONE	
35	10.7									
40	12.2									40.0
45	13.7									
50	15.2									

Reviewd Date:
Reviewd By:

BORING LOG 77300R-1.GPJ TESD.GDT 1/4/05

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BORING LOG

Lake Cuyamaca Recreation Park
Lake Cuyamaca, California

CONTRACT NO.	REPORT DATE	FIGURE
77300		A-3

DATE DRILLED 9/30/04 BORING NO. MW-3
GROUND ELEVATION 4725' ± SHEET 2 OF 5
METHOD DRILLING Air Rotary
LOGGED BY Driller DRIVE WEIGHT N/A DROP N/A

DEPTH (feet)	DEPTH (meters)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	U.S.C.S. CLASSIFICATION	DESCRIPTION	WELL CONSTRUCTION
55	16.8								Dense gray SILTSTONE *(continued)*	
									Fracture purged water table	
60	18.3								Hard Rock Gray SILTSTONE	
65	19.8									
70	21.3									
75	22.9									
80	24.4									
85	25.9									
90	27.4									
95	29.0									
100	30.5									

Reviewd Date:
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BORING LOG 77300R-1.GPJ TESD.GDT 1/3/05

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BORING LOG
Lake Cuyamaca Recreation Park
Lake Cuyamaca, California

CONTRACT NO.	REPORT DATE	FIGURE
77300		A-4

DATE DRILLED 9/30/04 BORING NO. MW-3
GROUND ELEVATION 4725' ± SHEET 3 OF 5
METHOD DRILLING Air Rotary
LOGGED BY Driller DRIVE WEIGHT N/A DROP N/A

DEPTH (feet)	DEPTH (meters)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	U.S.C.S. CLASSIFICATION	DESCRIPTION	WELL CONSTRUCTION
105	32.0								Hard Rock Gray SILTSTONE *(continued)*	
110	33.5									
115	35.1									
120	36.6									
125	38.1									
130	39.6									
135	41.1									
140	42.7									
145	44.2									
150	45.7									

Reviewd Date:
Reviewd By:

BORINGLOG 77300R-1.GPJ TESD.GDT 1/3/05

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BORING LOG

Lake Cuyamaca Recreation Park
Lake Cuyamaca, California

CONTRACT NO.	REPORT DATE	FIGURE
77300		A-5

DATE DRILLED 9/30/04 BORING NO. MW-3
GROUND ELEVATION 4725'± SHEET 4 OF 5
METHOD DRILLING Air Rotary
LOGGED BY Driller DRIVE WEIGHT N/A DROP N/A

DEPTH (feet)	DEPTH (meters)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	U.S.C.S. CLASSIFICATION	DESCRIPTION	WELL CONSTRUCTION
155	47.2								Hard Rock Gray SILTSTONE *(continued)*	
					▽				Saturated water table at 157 feet	
160	48.8								Hard Rock Gray SILTSTONE	
165	50.3									
170	51.8									
175	53.3									
180	54.9									
185	56.4									
190	57.9									
195	59.4									
200	61.0									

Reviewd Date:
Reviewd By:

BORING LOG 77300R-1.GPJ TESD.GDT 1/3/05

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BORING LOG

Lake Cuyamaca Recreation Park
Lake Cuyamaca, California

CONTRACT NO.	REPORT DATE	FIGURE
77300		A-6

DATE DRILLED 9/30/04 BORING NO. MW-3
GROUND ELEVATION 4725' ± SHEET 5 OF 5
METHOD DRILLING Air Rotary
LOGGED BY Driller DRIVE WEIGHT N/A DROP N/A

DEPTH (feet)	DEPTH (meters)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	U.S.C.S. CLASSIFICATION	DESCRIPTION	WELL CONSTRUCTION
205	62.5								Hard Rock Gray SILTSTONE *(continued)*	
210	64.0									
215	65.5									
220	67.1									
225	68.6									
230	70.1									
235	71.6								Total Depth = 233.0 feet Groundwater encountered at 157 feet	
240	73.2									
245	74.7									
250	76.2									

Reviewd Date:
Reviewd By:

BORING LOG 77300R-1.GPJ TESD.GDT 1/3/05

TE - USL U.S. LABS

Testing Engineers - U.S. Labs
7895 Convoy Court, Suite 18
San Diego, CA 92111

BORING LOG

Lake Cuyamaca Recreation Park
Lake Cuyamaca, California

CONTRACT NO.	REPORT DATE	FIGURE
77300		A-7

Appendix B: Groundwater Quality Test Reports

Environmental Engineering Laboratory

3538 Hancock Street

San Diego, CA 92110

(619) 298-6131

Recipient:	Georgia Martin Lake Cuyamaca Recreation and Park District 15027 Hwy 79 Julian, CA 92036	**Matrix:**	WASTEWATER
		Sampled:	10/08/2004 6:30
		Received:	10/08/2004 10:55
		Collection Address:	Sunrise & Hwy 79
		Sample Location:	Monitoring Well #1
Reference:	0425051	**Description:**	L.C.R.P.D.
Lab ID:	0425051-001	**Date Started:**	10/08/2004
Sample #:		**Date Completed:**	10/22/2004
Project#:		**PS Code:**	37C
Comment:	Copy: County of S.D. & Nova Tech FAX: 760-765-1749		

Test Parameters

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Date Analyzed	Analyst
Boron	0.12	mg/L	0.01	-	1	SM 3120B	10/14/2004	MMC
Chloride	124	mg/L	0.2	-	1	EPA 300.0	10/08/2004	MEH
Fluoride	0.47	mg/L	0.1		1	EPA 300.0	10/08/2004	MEH
Iron	3.8	mg/L	0.10	15	10	SM 3120B	10/14/2004	MMC
Manganese	0.04	mg/L	0.01	15	1	SM 3120B	10/14/2004	MMC
Nitrogen, Nitrate (as NO3)	92.0	mg/L	2.0		1	EPA 300.0	10/08/2004	MEH
Solids, Dissolved	692	mg/L	10		1	SM2450C	10/21/2004	RH
Sulfate	114	mg/L	1	-	1	EPA 300.0	10/08/2004	MEH
Sulfonated Detergent - MBAS	0.11	mg/L	0.250	-	1	SM 5540C	10/08/2004	RH

Approval: Director

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

Environmental Engineering Laboratory

3538 Hancock Street

San Diego, CA 92110

(619) 298-6131

Recipient:	Georgia Martin	**Matrix:**	WASTEWATER
	Lake Cuyamaca Recreation and Park District	**Sampled:**	02/17/2005 6:30
	15027 Hwy 79	**Received:**	02/17/2005 8:55
	Julian, CA 92036	**Collection Address:**	Hwy 79 Sunrise
Reference:	0526993	**Sample Location:**	Monitoring Well #2
Lab ID:	0526993-001	**Description:**	Cuyamaca Lake
Sample #:		**Date Started:**	02/17/2005
Project#:		**Date Completed:**	03/08/2005
		PS Code:	37C
Comment:	FAX: 760-765-1749 Attn: Race Paddock & Copy: County of S.D.		

Test Parameters

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Date Analyzed	Analyst
Boron	ND	mg/L	0.01	-	1	SM 3120B	03/08/2005	MEH
Chloride	11.6	mg/L	0.2	-	1	EPA 300.0	02/18/2005	CSV
Fluoride	0.09	mg/L	0.1	-	1	EPA 300.0	02/18/2005	CSV
Iron	1.65	mg/L	0.01		1	SM 3120B	03/07/2005	MEH
Manganese	0.170	mg/L	0.01		1	SM 3120B	03/07/2005	MEH
Nitrogen, Nitrate (as NO3)	8.01	mg/L	2.0		1	EPA 300.0	02/18/2005	CSV
Solids, Dissolved	169	mg/L	10		1	SM2450C	03/01/2005	JH
Sulfate	11.2	mg/L	1	-	1	EPA 300.0	02/18/2005	CSV
Sulfonated Detergent - MBAS	<0.05	mg/L	0.05	-	1	SM 5540C	02/18/2005	CSV

Recipient:	Georgia Martin	**Matrix:**	WASTEWATER
	Lake Cuyamaca Recreation and Park District	**Sampled:**	02/17/2005 7:00
	15027 Hwy 79	**Received:**	02/17/2005 8:55
	Julian, CA 92036	**Collection Address:**	Hwy 79 North Of Sunrise on West Side
Reference:	0526993	**Sample Location:**	Well #1
Lab ID:	0526993-002	**Description:**	Cuyamaca Lake
Sample #:		**Date Started:**	02/17/2005
Project#:		**Date Completed:**	03/08/2005
		PS Code:	37C
Comment:	FAX: 760-765-1749 Attn: Race Paddock & Copy: County of S.D.		

Test Parameters

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Date Analyzed	Analyst
Boron	ND	mg/L	0.01	-	1	SM 3120B	03/08/2005	MEH
Chloride	7.46	mg/L	0.2	-	1	EPA 300.0	02/18/2005	CSV
Fluoride	0.09	mg/L	0.1	-	1	EPA 300.0	02/18/2005	CSV
Iron	7.33	mg/L	0.01		1	SM 3120B	03/08/2005	MEH
Manganese	0.30	mg/L	0.01		1	SM 3120B	03/08/2005	MEH
Nitrogen, Nitrate (as NO3)	15.0	mg/L	2.0		1	EPA 300.0	02/18/2005	CSV
Solids, Dissolved	113	mg/L	10		1	SM2450C	03/01/2005	JH
Sulfate	4.43	mg/L	1	-	1	EPA 300.0	02/18/2005	CSV
Sulfonated Detergent - MBAS	<0.05	mg/L	0.05	-	1	SM 5540C	02/18/2005	CSV

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

Recipient:	Georgia Martin Lake Cuyamaca Recreation and Park District 15027 Hwy 79 Julian, CA 92036	**Matrix:**	WASTEWATER
		Sampled:	02/17/2005 7:00
		Received:	02/17/2005 8:55
		Collection Address:	Hwy 79 North Of Sunrise on West Side
Reference:	0526993	**Sample Location:**	Well #1
Lab ID:	0526993-002	**Description:**	Cuyamaca Lake
Sample #:		**Date Started:**	02/17/2005
Project#:		**Date Completed:**	03/08/2005
Comment:	FAX: 760-765-1749 Attn: Race Paddock & Copy: County of S.D.	**PS Code:**	37C

Approval: _____
Director

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

Environmental Engineering Lab **3538 Hancock Street, San Diego, CA 92110 Ph: 619-298-6131**

Environmental Engineering Laboratory

3538 Hancock Street

San Diego, CA 92110

(619) 298-6131

Recipient:	Georgia Martin Lake Cuyamaca Recreation and Park District 15027 Hwy 79 Julian, CA 92036	**Matrix:**	WASTEWATER
		Sampled:	12/23/2004 8:30
		Received:	12/23/2004 16:14
		Collection Address:	Sunrise And HWY 79
		Sample Location:	Monitoring Well #1
Reference:	0426198	**Description:**	L.C.R.P.D.
Lab ID:	0426198-001	**Date Started:**	12/23/2004
Sample #:		**Date Completed:**	01/12/2005
Project#:		**PS Code:**	37C
Comment:	FAX: 760-765-1749 Attn: Race Paddock		

Test Parameters

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Date Analyzed	Analyst
Boron	0.061	mg/L	0.01	-	1	SM 3120B	01/10/2005	MEH
Chloride	20.4	mg/L	0.2	-	1	EPA 300.0	12/29/2004	CSV
Fluoride	0.44	mg/L	0.1	-	1	EPA 300.0	12/29/2004	CSV
Iron	8.35	mg/L	0.01		1	SM 3120B	01/11/2005	MEH
Manganese	0.38	mg/L	0.01		1	SM 3120B	01/11/2005	MEH
Nitrogen, Nitrate (as NO3)	9.42	mg/L	2.0		1	EPA 300.0	12/27/2004	CSV
Solids, Dissolved	232	mg/L	10		1	SM2450C	12/29/2004	CMB
Sulfate	39.7	mg/L	1	-	1	EPA 300.0	12/29/2004	CSV
Sulfonated Detergent - MBAS	0.05	mg/L	0.05	-	1	SM 5540C	12/23/2004	MEH

Approval: _____
Director

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

Environmental Engineering Laboratory

3538 Hancock Street

San Diego, CA 92110

(619) 298-6131

Recipient:	Georgia Martin	**Matrix:**	WASTEWATER
	Lake Cuyamaca Recreation and Park District	**Sampled:**	12/23/2004 10:00
	15027 Hwy 79	**Received:**	12/23/2004 16:14
	Julian, CA 92036	**Collection Address:**	North of Sunrise on the West Side of the Highway
Reference:	0426198	**Sample Location:**	Monitoring Well #2
Lab ID:	0426198-002	**Description:**	L.C.R.P.D.
Sample #:		**Date Started:**	12/23/2004
Project#:		**Date Completed:**	01/12/2005
Comment:	FAX: 760-765-1749 Attn: Race Paddock	**PS Code:**	37C

Test Parameters

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Date Analyzed	Analyst
Boron	0.035	mg/L	0.01	-	1	SM 3120B	01/10/2005	MEH
Chloride	93.2	mg/L	0.2	-	1	EPA 300.0	12/29/2004	CSV
Fluoride	0.40	mg/L	0.1	-	1	EPA 300.0	12/29/2004	CSV
Iron	2.86	mg/L	0.01		1	SM 3120B	01/11/2005	MEH
Manganese	ND	mg/L	0.01		1	SM 3120B	01/11/2005	MEH
Nitrogen, Nitrate (as NO3)	16.7	mg/L	2.0		1	EPA 300.0	12/27/2004	CSV
Solids, Dissolved	284	mg/L	10		1	SM2450C	12/29/2004	CMB
Sulfate	26.7	mg/L	1	-	1	EPA 300.0	12/29/2004	CSV
Sulfonated Detergent - MBAS	0.13	mg/L	0.05	-	1	SM 5540C	12/23/2004	MEH

Approval: Director

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

Environmental Engineering Laboratory

3538 Hancock Street
San Diego, CA 92110
(619) 298-6131

Recipient:	Georgia Martin	**Matrix:**	WASTEWATER
	Lake Cuyamaca Recreation and Park District	**Sampled:**	02/28/2005
	15027 Hwy 79	**Received:**	02/28/2005 8:40
	Julian, CA 92036	**Collection Address:**	Hwy 79 Sunrise
Reference:	0527104	**Sample Location:**	Monitoring Well #2
Lab ID:	0527104-001	**Description:**	Cuyamaca Lake
Sample #:		**Date Started:**	02/28/2005
Project#:		**Date Completed:**	03/10/2005
Comment:	FAX: 760-765-1749 Attn: Race Paddock	**PS Code:**	37C

Test Parameters

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Date Analyzed	Analyst
Boron	ND	mg/L	0.01	-	1	SM 3120B	03/08/2005	MEH
Chloride	13.3	mg/L	0.2	-	1	EPA 300.0	02/28/2005	CSV
Fluoride	0.10	mg/L	0.1	-	1	EPA 300.0	02/28/2005	CSV
Iron	0.860	mg/L	0.01		1	SM 3120B	03/07/2005	MEH
Manganese	0.040	mg/L	0.01		1	SM 3120B	03/07/2005	MEH
Nitrogen, Nitrate (as NO3)	8.72	mg/L	2.0		1	EPA 300.0	02/28/2005	CSV
Solids, Dissolved	157	mg/L	10		1	SM2450C	03/01/2005	JH
Sulfate	12.8	mg/L	1	-	1	EPA 300.0	02/28/2005	CSV
Sulfonated Detergent - MBAS	<0.05	mg/L	0.05	-	1	SM 5540C	03/02/2005	CSV

Recipient:	Georgia Martin	**Matrix:**	WASTEWATER
	Lake Cuyamaca Recreation and Park District	**Sampled:**	02/28/2005
	15027 Hwy 79	**Received:**	02/28/2005 8:40
	Julian, CA 92036	**Collection Address:**	Hwy 79 North Of Sunrise on West Side
Reference:	0527104	**Sample Location:**	Well #1
Lab ID:	0527104-002	**Description:**	Cuyamaca Lake
Sample #:		**Date Started:**	02/28/2005
Project#:		**Date Completed:**	03/10/2005
Comment:	FAX: 760-765-1749 Attn: Race Paddock	**PS Code:**	37C

Test Parameters

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Date Analyzed	Analyst
Boron	ND	mg/L	0.01	-	1	SM 3120B	03/08/2005	MEH
Chloride	8.94	mg/L	0.2	-	1	EPA 300.0	02/28/2005	CSV
Fluoride	0.14	mg/L	0.1	-	1	EPA 300.0	02/28/2005	CSV
Iron	1.22	mg/L	0.01		1	SM 3120B	03/07/2005	MEH
Manganese	0.020	mg/L	0.01		1	SM 3120B	03/07/2005	MEH
Nitrogen, Nitrate (as NO3)	13.3	mg/L	2.0		1	EPA 300.0	02/28/2005	CSV
Solids, Dissolved	145	mg/L	10		1	SM2450C	03/01/2005	JH
Sulfate	5.84	mg/L	1	-	1	EPA 300.0	02/28/2005	CSV
Sulfonated Detergent - MBAS	0.231	mg/L	0.05	-	1	SM 5540C	03/02/2005	CSV

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

Recipient:	Georgia Martin	**Matrix:**	WASTEWATER
	Lake Cuyamaca Recreation and Park District	**Sampled:**	02/28/2005
	15027 Hwy 79	**Received:**	02/28/2005 8:40
	Julian, CA 92036	**Collection Address:**	Hwy 79 North Of Sunrise on West Side
Reference:	0527104	**Sample Location:**	Well #1
Lab ID:	0527104-002	**Description:**	Cuyamaca Lake
Sample #:		**Date Started:**	02/28/2005
Project#:		**Date Completed:**	03/10/2005
Comment:	FAX: 760-765-1749 Attn: Race Paddock	**PS Code:**	37C

Approval:_____
Director

RL = Reporting Limit MCL = Maximum Contaminant Level **MDL = Method Detection Limit** N/A = Not Applicable

Environmental Engineering Lab **3538 Hancock Street, San Diego, CA 92110 Ph: 619-298-6131**

ENVIRONMENTAL ENG. LAB FAX:619-298-6131 Mar 10 '05 14:14 P.05

Environmental Engineering Laboratory
3538 Hancock Street
San Diego, CA 92110
(619) 298-6131

Recipient:	Georgia Martin Lake Cuyamaca Recreation and Park District 15027 Hwy 79 Julian, CA 92036	**Matrix:**	WASTEWATER
		Sampled:	03/25/2005
		Received:	03/25/2005 14:40
		Collection Address:	Hwy 79 Sunrise
Reference:	0527460	**Sample Location:**	Monitoring Well #2
Lab ID:	0527460-001	**Description:**	Cuyamaca Lake
Sample #:		**Date Started:**	03/25/2005
Project#:		**Date Completed:**	04/22/2005
Comment:	FAX: 760-765-1749 Attn: Race Paddock Copy:County	**PS Code:**	37C

Test Parameters

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Date Analyzed	Analyst
Boron	ND	mg/L	0.01	-	1	SM 3120B	04/22/2005	MEH
Chloride	11.5	mg/L	0.2	-	1	EPA 300.0	03/25/2005	MEH
Fluoride	0.140	mg/L	0.1	-	1	EPA 300.0	03/25/2005	JH
Iron	0.690	mg/L	0.01		1	SM 3120B	04/22/2005	MEH
Manganese	0.020	mg/L	0.01		1	SM 3120B	04/22/2005	MEH
Nitrogen, Nitrate (as NO3)	9.74	mg/L	2.0		1	EPA 300.0	03/25/2005	MEH
Solids, Dissolved	126	mg/L	10		1	SM2450C	03/28/2005	JH
Sulfate	11.6	mg/L	1	-	1	EPA 300.0	03/25/2005	CSV
Sulfonated Detergent - MBAS	ND	mg/L	0.05	-	1	SM 5540C	03/26/2005	MEH

Recipient:	Georgia Martin Lake Cuyamaca Recreation and Park District 15027 Hwy 79 Julian, CA 92036	**Matrix:**	WASTEWATER
		Sampled:	03/25/2005
		Received:	03/25/2005 14:40
		Collection Address:	Hwy 79 North Of Sunrise on West Side
Reference:	0527460	**Sample Location:**	Well #1
Lab ID:	0527460-002	**Description:**	Cuyamaca Lake
Sample #:		**Date Started:**	03/25/2005
Project#:		**Date Completed:**	04/22/2005
Comment:	FAX: 760-765-1749 Attn: Race Paddock Copy:County	**PS Code:**	37C

Test Parameters

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Date Analyzed	Analyst
Boron	ND	mg/L	0.01	-	1	SM 3120B	04/22/2005	MEH
Chloride	4.4	mg/L	0.2	-	1	EPA 300.0	03/25/2005	MEH
Fluoride	0.110	mg/L	0.1	-	1	EPA 300.0	03/25/2005	JH
Iron	7.55	mg/L	0.01		1	SM 3120B	04/22/2005	MEH
Manganese	0.090	mg/L	0.01		1	SM 3120B	04/22/2005	MEH
Nitrogen, Nitrate (as NO3)	9.61	mg/L	2.0		1	EPA 300.0	03/25/2005	MEH
Solids, Dissolved	100	mg/L	10		1	SM2450C	03/28/2005	JH
Sulfate	2.8	mg/L	1	-	1	EPA 300.0	03/25/2005	CSV
Sulfonated Detergent - MBAS	ND	mg/L	0.05	-	1	SM 5540C	03/26/2005	MEH

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

Environmental Engineering Laboratory

3538 Hancock Street

San Diego, CA 92110

(619) 298-6131

Recipient:	Georgia Martin	**Matrix:**	WASTEWATER
	Lake Cuyamaca Recreation and Park District	**Sampled:**	03/28/2005 6:45
	15027 Hwy 79	**Received:**	03/28/2005 10:50
	Julian, CA 92036	**Collection Address:**	Access Road to Site
Refrrence:	0527465	**Sample Location:**	Monitoring Well #3
Lab ID:	0527465-001	**Description:**	Cuyamaca Lake
Sample #:		**Date Started:**	03/28/2005
Project#:		**Date Completed:**	04/22/2005
Comment:	FAX: 760-765-1749 Attn: Race Paddock Fax also to 8586763625	**PS Code:**	37C

Test Parameters

Parameter	Result	Units	RL	MCL	Dilution Factor	Method	Date Analyzed	Analyst
Boron	ND	mg/L	0.01	-	1	SM 3120B	04/22/2005	MEH
Chloride	64.8	mg/L	0.2	-	1	EPA 300.0	03/29/2005	MEH
Fluoride	0.10	mg/L	0.1	-	1	EPA 300.0	03/29/2005	JH
Iron	0.180	mg/L	0.01		1	SM 3120B	04/22/2005	MEH
Manganese	0.010	mg/L	0.01		1	SM 3120B	04/22/2005	MEH
Nitrogen, Nitrate (as NO3)	13.9	mg/L	2.0		1	EPA 300.0	03/29/2005	CMB
Solids, Dissolved	182	mg/L	10		1	SM2450C	04/04/2005	JH
Sulfate	16.2	mg/L	1	-	1	EPA 300.0	03/29/2005	CSV
Sulfonated Detergent - MBAS	ND	mg/L	0.05	-	1	SM 5540C	03/26/2005	MEH

Approval: _____
Director

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

Lake Cuyamaca Recreation and Park District
15027 Hwy 79
Julian, CA 92036

Reference: 0527460
Lab ID: 0527460-002
Sample #:
Project#:
Comment: FAX: 760-765-1749 Attn: Race Paddock
Copy:County

Sampled: 03/25/2005
Received: 03/25/2005 14:40
Collection Address: Hwy 79 North Of Sunrise on West Side
Sample Location: Well #1
Description: Cuyamaca Lake
Date Started: 03/25/2005
Date Completed: 04/22/2005
PS Code: 37C

Approval: _____
Director

RL = Reporting Limit MCL = Maximum Contaminant Level MDL = Method Detection Limit N/A = Not Applicable

Environmental Engineering Lab **3538 Hancock Street, San Diego, CA 92110 Ph: 619-298-6131**